Spot Safety Project Evaluation

Project Log # 200412118

Spot Safety Project # 06-93-028

Spot Safety Project Evaluation, of the Turn Lane Construction and Pavement Widening And the Installation of Post Mounted "Vehicle Entering When Flashing" Signs, At the Intersection of NC 210 and SR 1403-Harnett Central Road, in Harnett County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 4/8/2005_____
Carrie L. Goodrich Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 06-93-028 – The Intersection of NC 210 and SR 1403-Harnett Central Road in Harnett County

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis and an Odds Ratio comparison analysis have been completed to measure the effectiveness of the spot safety improvement. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location were the widening of NC 210 and SR 1403-Harnett Central Road to provide left-turn lanes and right turn lanes/tapers at the intersection and the installation of post mounted "Vehicles Entering When Flashing" signs on NC 210. Senator Elaine F. Marshall originally requested the improvements. Both NC 210 and SR 1403-Harnett Central Road have a posted speed limit of 55 mph. Prior to the countermeasures, both roads were two-lane facilities at the intersection. Currently, northbound NC 210 has a left-turn lane, a thru lane, and a right-turn lane; southbound NC 210 has a left–turn lane and a thru and right-turn lane; and westbound SR 1403-Harnett Central Road has a left-turn lane and a thru and right-turn lane. Eastbound SR 1403-Harnett Central Road is still a two-lane facility at the treatment intersection. SR 1403-Harnett Central Road is stop sign controlled at the intersection with NC 210.

Harnett Central Middle School and High School are located just east of the subject intersection. The spot safety project stemmed from parents concerned with safety at this intersection and around the school complex. This intersection experiences heavy peak periods of traffic when the two school days begin and end. The turn lanes were added to provide storage for vehicles attempting to turn and to prevent unnecessary delays. The initial crash analysis for this location was completed from September 1, 1990 through August 31, 1993 with a total of 3 reported crashes. There was one Rear-End Crash, one Left-Turn Crash, and one Angle Crash. Two class A and two class C injuries resulted. The final completion date for the improvement at the subject intersection was on January 12, 1998.

Comparison Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from August 1, 1997 through April 30, 1998. The before period consisted of reported crashes from August 1, 1991 through July 31, 1997 (6 Years) and the after period consisted of reported crashes from May 1, 1998 through April 30, 2004 (6 Years). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The analysis also consisted of two different sets of data, the treatment and the comparison data. The treatment data consisted of all crashes within 150 feet of the subject intersection. The comparison data consisted of all crashes within a 150 feet Y-line on NC 210, from 500 feet south of SR 1403-Harnett Central Road to 150 feet south of SR 1435-SR 1515-Tripp Road-Cauldon Brown Road. Please see attached *Location Map* for further detail. The following data table depicts the Naive Before and After Analysis for the treatment and comparison information. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Treatment Information

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	6	15	150.0
Total Severity Index	7.17	6.43	- 10.3
Frontal Impact Crashes	6	13	116.7
Frontal Severity Index	7.17	6.12	- 14.6
Volume	6000	7800	30.0

Comparison Information

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Total Crashes	16	27	68.8
Total Severity Index	12.79	6.27	- 51.0
Frontal Impact Crashes	2	3	50.0
Volume	7300	9500	30.1

Odds Ratio: Treatment versus Comparison

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Treatment Total Crashes	6	15	---
Comparison Total Crashes	16	27	48.2 %

The naive before and after analysis at the treatment location resulted in a 150.0 percent increase in Total Crashes, a 10.3 percent decrease in the Total Severity Index, and a 30.0 percent increase in Average Daily Traffic (ADT). The comparison location experienced a 68.8 percent increase in Total Crashes, a 51.0 percent decrease in the Total Severity Index, and a 30.1 percent increase in ADT. The before period ADT year was 1994 and the after period ADT year was 2001.

The Odds Ratio is used as another means of calculating the treatment effect. The number of crashes in the before and after period from the Comparison Strip are used to calculate the percent reduction in crashes for the Treatment Intersection. As shown in the previous table, using the Odds Ratio calculation, there is a 48.2 percent increase in Treatment Intersection crashes.

Results and Discussion

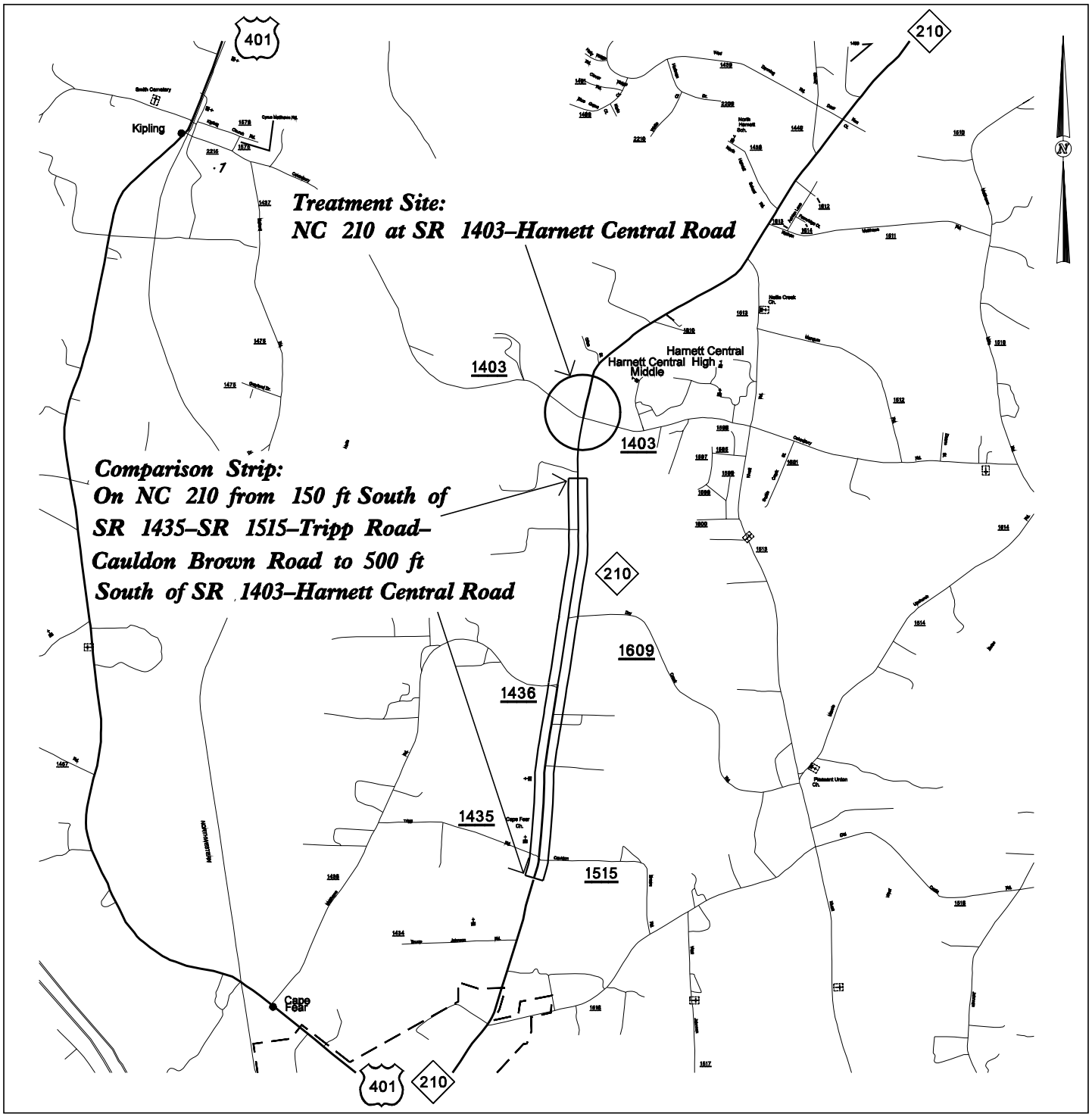
The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 150.0 percent increase in Total Crashes and a 116.7 percent increase in Frontal Impact Crashes. Using the Odds Ratio to calculate the treatment effect resulted in a 48.2 percent increase in Total Crashes at the Treatment Intersection. The summary results above demonstrate that in both analysis methods the treatment location appears to have had a substantial increase in the number of crashes from the before to the after period.

It appears that the large number of Frontal Impact crashes is occurring because motorists on SR 1403-Harnett Central Road are unable to find acceptable gaps in traffic. The treatment intersection ADT increased by 30.0% from the before period to the after period. Further investigation of the after period crash data reveals that 12 out of the 15 crashes (80.0 percent) at the treatment intersection occurred between the hours of 7 a.m. to 9 a.m. and 2 p.m. to 7 p.m. In addition, 12 out of the 15 after period crashes occurred between the weekdays of Monday through Friday. It appears that an increase in traffic on NC 210 combined with the heavy peak periods of school-related traffic on SR 1403-Harnett Central Road has increased the crash potential at the subject intersection.

Please see the attached *Treatment Site Location Photos*. Photos are provided for each leg of the treatment intersection. The site visit for this location was performed in the afternoon just after the high school was adjourned for the day. Long queues formed on westbound SR 1403-Harnett Central School Road (as shown in the photo looking east on SR 1403-Harnett Central Road). Also note the photo which shows one of the “Vehicles Entering When Flashing” signs on NC 210 in advance of the intersection.

The countermeasure crash reduction for Total Crashes at the subject intersection can be in the range of a 48.2 percent increase to a 150.0 percent increase in crashes. The countermeasure crash reduction for Frontal Impact Crashes at the subject intersection is a 116.7 percent increase in crashes. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors.

Location Map, Harnett County
Evaluation of Spot Safety Project Number 06–93–028



Treatment Site Photo (Taken on November 12, 2004)

Looking east on SR 1403-Harnett Central Road

Looking west on SR 1403-Harnett Central Road

Treatment Site Photo (Taken on November 12, 2004)

Looking north on NC 210

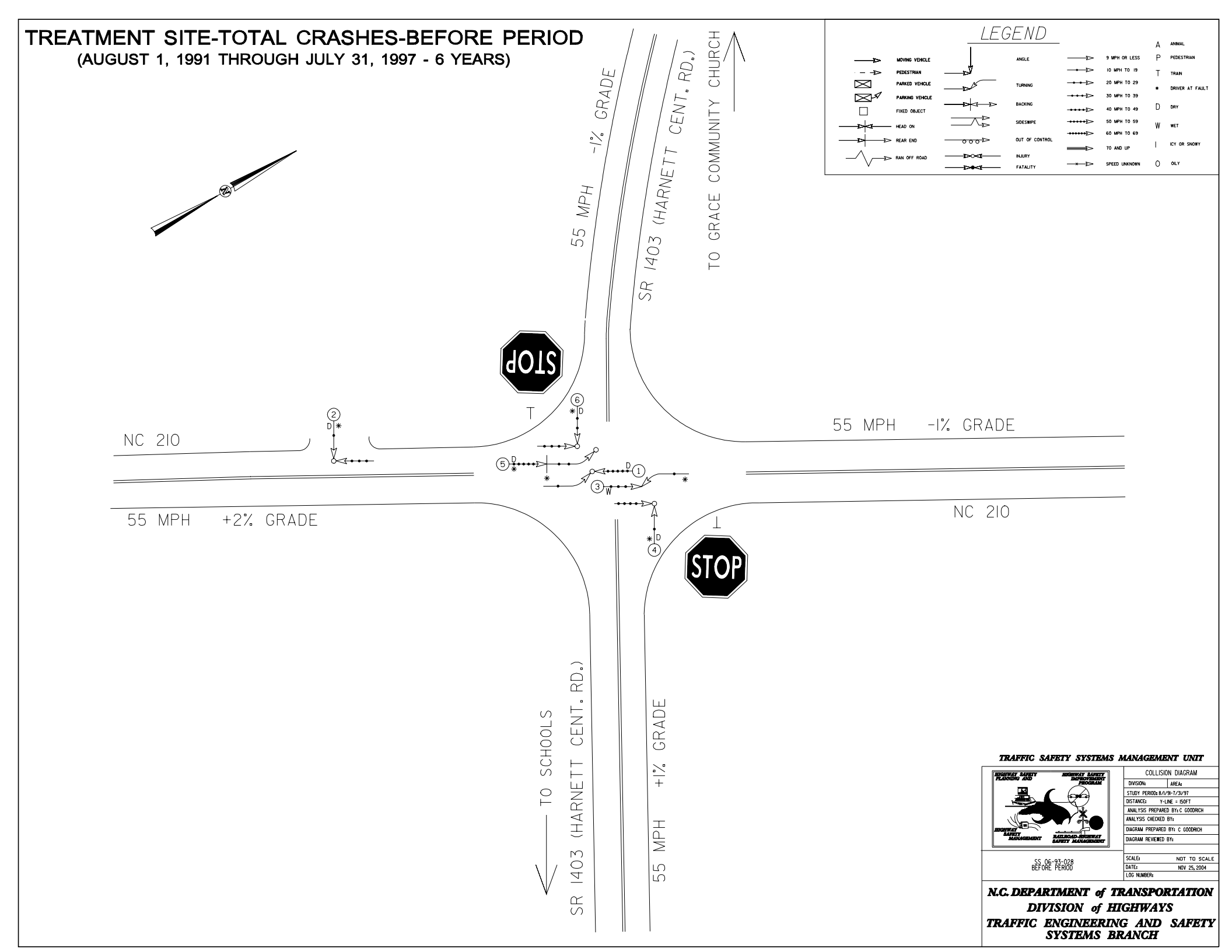
Looking south on NC 210

Treatment Site Photo (Taken on November 12, 2004)

Approaching SR 1403-Harnett Central Road on northbound NC 210
Notice the “Vehicles Entering When Flashing” sign.

TREATMENT SITE-TOTAL CRASHES-BEFORE PERIOD

(AUGUST 1, 1991 THROUGH JULY 31, 1997 - 6 YEARS)



TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION:	AREA:
STUDY PERIOD: 8/1/91-7/31/97	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: C GOODRICH	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: C GOODRICH	
DIAGRAM REVIEWED BY:	
SCALE:	NOT TO SCALE
DATE:	NOV 25, 2004
LOG NUMBER:	

SS 06-93-028
BEFORE PERIOD

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH

TREATMENT SITE-TOTAL CRASHES-AFTER PERIOD

(MAY 1, 1998 THROUGH APRIL 30, 2004 - 6 YEARS)

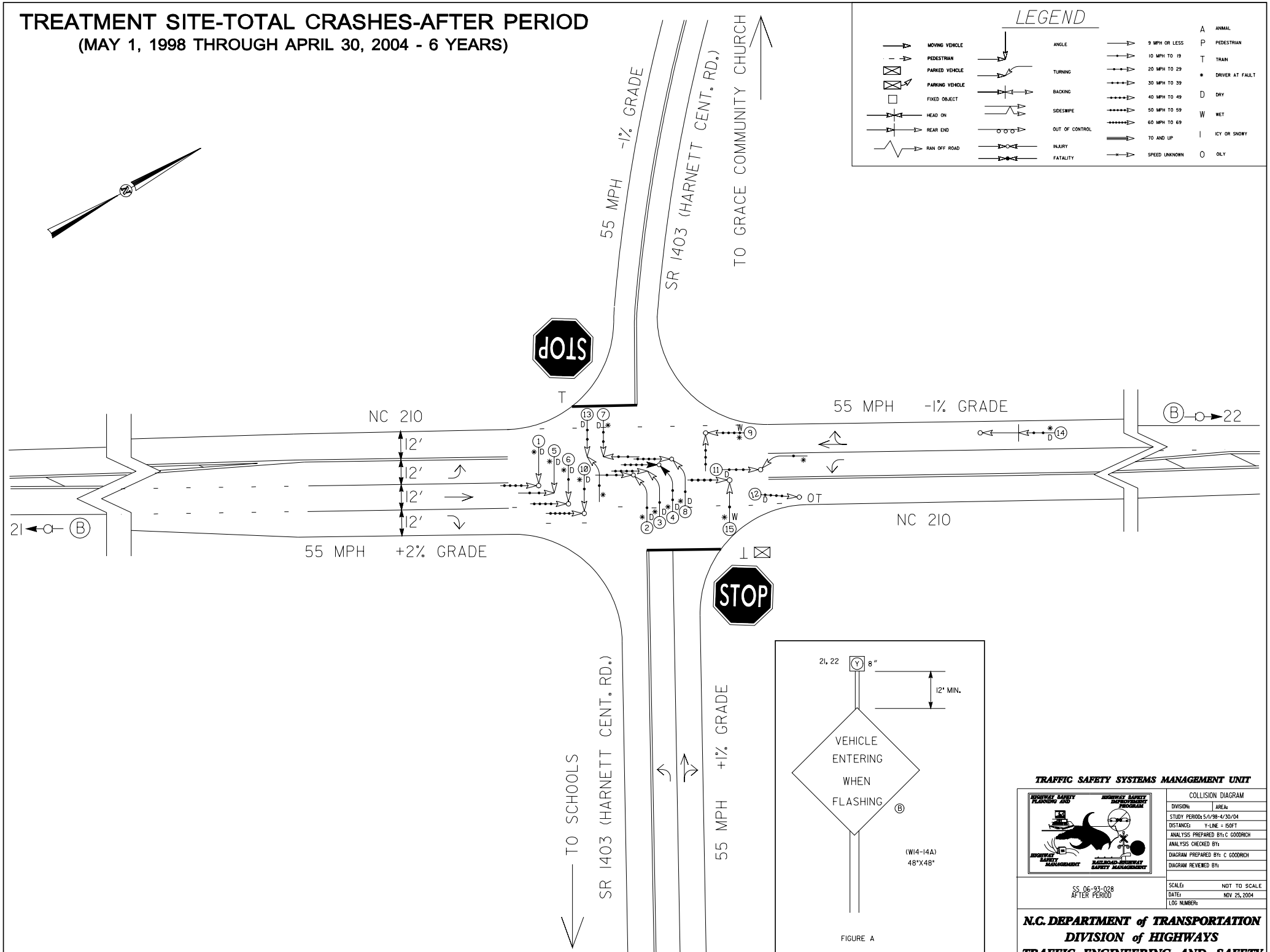


FIGURE A

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION:	AREA:
STUDY PERIOD: 5/1/98-4/30/04	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: C GOODRICH	
ANALYSIS CHECKED BY:	
DIAGRAM PREPARED BY: C GOODRICH	
DIAGRAM REVIEWED BY:	
SCALE:	NOT TO SCALE
DATE:	NOV 25, 2004
LOG NUMBER:	

SS 06-93-028
AFTER PERIOD

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH